

WHITMAN MISSION NATIONAL HISTORIC SITE

DOAN CREEK RESTORATION PROJECT

ENVIRONMENTAL ASSESSMENT



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Chapter One: Purpose of and Need for Action

Background

This document addresses the problem of how to handle the non-irrigation water that will begin flowing once again in portions of the original Doan Creek. The Doan Creek Irrigation Ditch, which runs through Whitman Mission National Historic Site (NHS), supplies water to the park and to two downstream irrigators. The Washington State Department of Fish and Wildlife has notified the park superintendent that it will issue the National Park Service a citation for non-compliance if a fish screen is not installed on Doan Creek by August 1, 2004. Washington State law requires a fish screen between irrigation water and streams that could contain fish. While each pumping station along the irrigation ditch could have its own fish screen, the state Department of Fish and Wildlife advocates a single fish screen at the park's east boundary. The fish screen will spill some water out of the irrigation ditch in order to operate the water-powered paddles which gently remove debris from the screen so water can pass through it into the irrigation ditch. Water that spills out of the irrigation ditch while driving the paddles will go into a channel that connects with the original Doan Creek water course. The original water course has not been in use for over seventy years.

Whitman Mission NHS views this as an opportunity to enhance the riparian habitat of the park through the restoration of the old water course which runs from the beginning of the irrigation ditch, across the Northern Fields of the park (see Appendix A), and into Mill Creek. This restoration would not only improve conditions for existing wildlife, but it would also allow for the reintroduction of fish passage from Mill Creek to Doan Creek.

Objectives

By restoring Doan Creek to roughly its original water course across the Northern Fields of the park, Whitman Mission NHS hopes to accomplish the following objectives:

- To restore natural processes to Whitman Mission NHS (General Management Plan (GMP), approved September, 2000, page 16)
- To increase the potential for wildlife in the northern fields of the park (GMP, page 46)
- To reintroduce fish passage to Doan Creek (Walla Walla County Conservation District Doan Creek Channel Restoration Plan, Appendix B)

Related Documents

The alternatives proposed and evaluated are directly related to the Whitman Mission NHS General Management Plan and Environmental Impact Statement, approved and released in September of 2000. This plan was designed to provide the “framework to guide the management of the national historic site for the next 15-20 years” (GMP, page ii). The General Management Plan specifically calls for re-establishing a natural Doan Creek flowing across the northern one-third of the park (GMP, page 16).

Decision Maker’s Options

The re-establishment of Doan Creek is called for in the Whitman Mission National Historic Site General Management Plan/Environmental Impact Statement, approved September, 2000. Therefore, the decision made on this document will either approve or deny the Walla Walla County Conservation District’s “Doan Creek Channel Restoration” as the plan for how the re-establishment should take place. In the evaluation of this Environmental Assessment the decision maker has the following options:

- To approve the project as submitted in the Doan Creek Channel Restoration Plan, Walla Walla County Conservation District, August, 2003 (Appendix B)
- To approve the project with specific constraints or changes
- To take no action to re-establish Doan Creek between the eastern diversion box and Mill Creek after a Washington State approved fish screen is installed at the park's east boundary

Scoping

During preparation of the Whitman Mission NHS General Management Plan the re-establishing of a natural flowing Doan Creek across the northern one-third of the park was identified, and meetings were held to gather information about how to implement such restoration. All park neighbors, as well as state water management representatives, a National Park Service national water resources representative, and a local state legislator attended the meeting.

A list of 22 concerns were recorded and combined into the following six relevant effects on the physical, social, biological, and economic resources of Whitman Mission National Historic Site. The relevant issues are listed in the following section. In addition to this meeting Doan Creek restoration was a topic at most of the public meetings for the Whitman Mission NHS General Management Plan. The appendix lists agencies consulted.

Issues and Impact Topics

Quality of Fish Habitat

- Minimum Flow of water past fish screen may not be enough for year round flow to Mill Creek via the restored channel. *Indicator: fish in stream/CFS flowing through channel ratio.*

- Habitat quality could also be affected by the water current and temperature, and the level of in-stream debris. *Indicator: fish in stream/temperature, fish in stream/water current, and fish in stream/debris ratio.*

Effects on Wetlands

- Half of the area in which the excavation would take place is considered wetlands. This area may see improvement in species diversity and/or habitat, but would not be harmed as a result of this project. *Indicator: species diversity.*

Potential Archaeological Discoveries

- Due to the location of the land on a historic site, excavation of the Doan Creek channel could result in the uncovering of items of archaeological significance. *Indicator: artifacts.*

Effects on Downstream Irrigators

- The fish screen, which the park has been mandated to install by state law, will spill some water out of the irrigation ditch making it unavailable to downstream irrigators. *Indicator: amount of water removed from the irrigation ditch.* Down stream users have a legal right to the volume of water identified on their water certificates. Diversion of water to the more natural water course can not interrupt legal water rights.
- The greatest risk of water rights conflict would most likely occur during hot, dry summers. *Indicator: CFS of irrigation ditch water volume during the summer season*
- There is no net loss in available irrigation water as a result of NPS action of installing the fish screen. *Indicator: All downstream irrigators are subject to state requirement for fish screening at pump intakes. Water used to power cleaning brushes at other pump intakes would likewise be unavailable for irrigation use.*

Effects on Visitors

- Steelhead fisherman may be inconvenienced by having only one spot (via a culvert) to cross to the northern side of the Northern Fields and Waterways area of the park. *Indicator: number of inconvenienced fisherman.*
- A line of trees planted along the stream bank would partially screen railroad tracks from visitors in the picnic area. *Indicator: visibility of railroad tracks.*
- Noise and dust during the excavation of the restored channel could cause a slight disturbance to visitors. *Indicator: noise and dust levels.*

Effects on Neighbors

- Drainage east of the park between the railroad tracks and Doan Creek may be affected, but would not be impaired. *Indicator: drainage levels.*
- Under the implementation of some alternatives the stability of the railroad embankment might be lessened as a result of the creek's close proximity to the tracks. *Indicator: embankment stability.*
- Noise and dust during the excavation of the restored channel could cause a slight disturbance to neighbors. *Indicator: noise and dust levels.*

Issues and Impact Topics Considered but Dismissed from Further Consideration

Displacement of Organisms

- This issue was disregarded because the park is not home to any threatened or endangered species, and any organisms that might be displaced during the excavation process would be able to resume their niche in the ecosystem when the excavation is completed, as the park does not plan to install any permanent, unnatural structures, while restoring the channel.

Soil Erosion and Takeover of Noxious Weeds along Stream Banks

- This issue has been disregarded because all plans to restore the creek include replanting native vegetation along the restored creek banks. These plants would prevent excessive erosion as well as slow the takeover of noxious weeds. In

addition, all alternatives for restoration also include measures to remove any and all noxious weeds that threaten native species around the banks of the creek.

Permits and Approvals Needed For Plan Completion

Before proceeding with this project, The Whitman Mission National Historic Site will be responsible for completing an “Assessment of Actions Having an Effect on Cultural Resources Section 106 Compliance.” The alternatives discussed in the next chapter will have the same federal requirements. The No Action alternative will not require the assessment mentioned above. The Whitman Mission National Historic Site will also be required to obtain a “Hydraulic Project Permit” from the Washington State Department of Fish and Wildlife.

Chapter Two: Description of Alternatives

Introduction

This chapter is an information source regarding the alternatives discussed in chapter three of this Environmental Assessment. As mentioned in the previous chapter, the proposed project will restore Doan Creek to roughly its original water course and install fish screens that meet state requirements, thus separating the stream and fish from the irrigation ditch and pumps. A variety of state laws mandates this protection for the fish. The alternatives listed in this chapter are meant to comply with environmental standards and the goals of the park to restore a habitat that is suitable for fish passage. Alternatives listed in this section include a no action alternative, the preferred alternative (C), and two additional alternatives that have been evaluated and considered less in accordance with the park's goals than the preferred. Creation of the Doan Creek Restoration Plan (Appendix B) involved individuals from NPS park management, natural and cultural resources management, a Washington State fish biologist, and an engineer and conservation coordinator from the Walla Walla County Conservation District. This Environmental Assessment has drawn upon the same group of people plus the expertise of an intern from the Whitman College environmental studies program.

Overview of Alternatives

In this chapter, the first alternative discussed, Alternative A, will be the No Action Plan, which will consider only the mandatory installation of a fish screen and no restoration of Doan Creek. Alternative B consists of a plan to restore Doan Creek into a relatively straight channel which runs along the northern fence line of the park. Alternative C proposes the restoration of a meandering course that wanders across the northern part of the property and strays from the straight path along the park's northern border. Alternative D incorporates the same restoration plan as Alternative C, but with the additional proposal of running part of the irrigation ditch through an irrigation pipe.

Alternative	Length of Excavation (feet)	Length of Pipe (feet)	Total Area Disturbed (square feet)
A (No Action)	0	0	0
B	1650	0	33000
C	2500	0	50000
D	2500	1870	87400

Element Common to All Alternatives

With the state mandate to install a fish screen on the Doan Creek irrigation ditch, the fish screen is an element common to all of the alternatives. The park will face legal action if the fish screen is not installed by late summer, 2004, as per the verbal warning issued to the superintendent by the Department of Fish and Wildlife. The fish screen's operation will allow irrigation water to pass through the screen but block fish from entering the irrigation ditch. Water used to power the screen cleaning brushes will be directed to flow northwest toward the original Doan Creek water course. Water used to power the cleaning brushes will not be available for irrigation use. This water loss is common to all alternative and irrigators. As such installation of the fish screen within the Park will have a no net loss of water for downstream users.

Alternatives Evaluated In Detail

Alternative A: Continue Present Maintenance and Use (No Action)

With the fish screen installed, water will continue to flow down the irrigation ditch and also will begin flowing toward the northwest across park land. Without a restored Doan Creek water course, the water will spread over lower portions of the northeast corner of the park, eventually flowing into a borrow ditch. The borrow ditch is on the north side of the park's north boundary, adjacent to the Union Pacific Railroad track. Water would then flow west between the railroad

and the park's north boundary, approximately 400 to 500 feet until it entered Mill Creek.

Continuing the No Action alternative will not restore a more natural Doan Creek, nor increase potential habitat for wildlife and fish in the park as recommended in the Whitman Mission National Historic Site General Management Plan, and could have an adverse impact on the railroad track bed.

Alternative B: Restoration of Channel to Enter Mill Creek along the Park's North Border

Alternative B would restore Doan Creek to its original channel for 1250 feet. The channel would continue another 400 feet to Mill Creek via a straight path along the north border of the park. The entire restored channel would be 1650 feet (see Appendix C). This alternative would also require that the park install a fish screen at the point where the irrigation ditch meets the restored channel.

This alternative would screen the irrigation ditch from the new stream channel. Part of the new stream channel, the western-most 400 feet that terminates into Mill Creek, would not provide a good habitat for endangered fish because it would be a straight channel with too great a gradient to provide suitable fish habitat. Its steeper gradient could create erosion problems within the park and the potential weakening of the railroad bed along the park's north boundary.

Alternative C: Restoration of Doan Creek to Enter Mill Creek 300 feet south of the Park's North Border

Alternative C would restore Doan Creek to roughly its original water course between the park's eastern diversion box and Mill Creek. The water way would flow across the northwest border of the park and enter Mill Creek 300 feet south of the park's northwest border. The entire restored waterway would contain meanderings in order to provide habitat that would be most suitable for the reintroduction of fish species to the creek. The total length of the restored stream with meanderings would be 2500 feet (see Appendix C). If at any point the slope of the channel exceeds -1%, stabilizing structures will be included to slow the

flow of the water. In addition the park will have to place a culvert across the restored stream to allow park employees and visitors access to other side of the creek.

This alternative creates a more gradual slope for the restored Doan Creek. This slope ensures there will be less erosion along the creek and provides an easier access for fish moving between Doan Creek and Mill Creek. While it is longer than Alternative B, it will be more stable over the long run and provide more opportunity for a higher quality fish habitat.

Alternative D: Installation of Pipe to Replace Irrigation Ditch

Alternative D would restore Doan Creek in the same manner as described in Alternative C. The entire restored waterway would be 2500 feet. Additionally, Alternative D would take the 1870 feet of the irrigation channel above the Oregon Trail and enclose it in an irrigation pipe. (This section in down slop from the eastern diversion box and within the existing irrigation channel.)

This alternative restores fish habitat to Doan Creek and also encloses much of the irrigation ditch in a pipe. Putting the irrigation water through a pipe would eliminate the water loss from seepage into the ground and decrease the loss due to evaporation that now occurs with the open irrigation ditch. The National Park Service has not used an engineer to plan use of an irrigation pipe or evaluate potential problems with its use. Laying pipe in the irrigation ditch is a project that could be accomplished at a later date, after specific engineering studies and plans are completed.

Mitigation and Monitoring Requirements of Each Alternative

Alternative A: Continue present maintenance and use (No Action)

The land that was once Doan Creek's natural course was intensively altered through agricultural use prior to being administered by the NPS. Allowing the water used to power the debris paddles to find it's own course over that land

today my result in water spilling over into park neighbors lands that historically were not impacted by Doan Creek. At a minimum the lands outside the parks north and northeast boundaries would have to be monitored for evidence of this type of encroachment. In addition the park staff would continue removing noxious weeds from along the irrigation ditch. The staff would also continue to clean the ditch, trimming, mowing, or removing other vegetation from the ditch bottom and sides to ensure an unimpeded water flow to downstream irrigators.

Alternative B: Restoration of Doan Creek to enter Mill Creek along the Park's north border

The park would plant native trees, shrubs, and grasses along the new channel immediately following the excavation of the new water course to prevent erosion. They would also continue to plant native vegetation during the two years following the completion of the project. The park would still be responsible for controlling vegetation along the irrigation ditch and also for removing noxious weeds as they appear along the restored streams path. With this alternative, the length of the new water course is shorter and steeper than under Alternative C. This creates a greater potential for erosion along the new channel. The park would have to mitigate the erosion in the steepest part of the channel to avoid impairment of the park's resources. The amount of erosion, the seriousness of the potential problem, and an estimated cost to prevent impairment of the resource are all unknown.

Alternative C: Restoration of Doan Ck. to enter Mill Creek 300 feet south of the Park's north border

The park's maintenance and management responsibilities would be the same as those given for Alternative B. This alternative creates a longer channel for Doan Creek and costs more initially than Alternative B, but this alternative has a greater chance of success for creating good fish habitat with fewer erosion and problems. It does create a longer channel for the park staff to monitor and control noxious weeds, but it will be easier for the staff to do weed control than repair erosion damage caused by the restored channel. The park staff has almost 20 years of weed control and revegetation experience, and can use integrated pest

management techniques for weed control. This alternative has less potential than alternative B does for impairment of park resources.

Alternative D: Installation of pipe to replace irrigation ditch

As mentioned in Alternatives B and C, the park would still be responsible for the reintroduction of native trees, shrubs, and grasses, and the removal of noxious weeds along the restored stream bed. However, Alternative D would eliminate the need for controlling vegetation along the upper 1870 feet of the irrigation ditch, since it would now be a buried pipe instead of an open irrigation ditch. Planning, engineering, and installation of a pipe would add significantly to the cost of this project. However, long term cost associated with the labor intensive maintenance of the open irrigation ditch would, over time, offset implementation cost.

Summary and Comparison of Alternatives

Alternative	Total Length of Project (feet)	Likelihood of Successful Fish Reintroduction	Native Plant Reintroduction	Effect on Visitors
A (No Action)	0	none	no	none
B	1650	moderate	yes	low
C	2500	high	yes	low
D	4370	high	yes	moderate

The Environmentally Preferred Alternative: Alternative C

The environmentally and agency preferred alternative is Alternative C. Alternative C was given preference because it would create a relatively small amount of disturbance to the natural environment, park visitors, and park neighbors. Although the disturbance would be minimal, Alternative C would restore Doan Creek to ideal habitat and spawning conditions for fish by minimizing erosion and creating a gradually descending, meandering natural stream.

Alternative A, which calls for no restoration activity to be undertaken, is not preferred because it does nothing to improve fish habitat and therefore does not meet the recommendations of the Whitman Mission NHS General Management Plan, Action item 13, Re-establishment of Doan Creek, on page 16. Potential adverse impacts could occur on neighboring lands from the unstructured flow water.

Alternative B was not selected as the preferred alternative because it has the potential to require more mitigation measures for erosion control. It creates the same disturbance to park neighbors and visitors as Alternative C, but because of the steeper gradient, the environmental disturbance will be greater due to increased erosion. Additionally, the habitat for fish is not as good as under Alternative C, thereby decreasing the chances for native species using the new water course.

Alternative D creates a fish habitat equivalent to that of Alternative C. However, alternative D would require the installation of a pipe through which irrigation water would be channeled. This installation would be more disruptive to the natural environment, park neighbors, and park visitors, than Alternative C.

For all of the reasons mentioned above, the park believes that Alternative C would be most effective in accomplishing the restoration goals of the General Management Plan, while creating the least amount of disturbance to the park's environment, as well as to the neighbors and visitors of the park.

Chapter Three: Description of Affected Environment and Environmental Consequences

Introduction

This chapter provides a detailed list of the environmental components affected and considers the consequences of the project on each of them. In the analysis of this section it is important to remember that issues considered irrelevant, or those that are relevant but covered by the mitigation measures in the second chapter will not be discussed here.

The area affected, as shown by the general map of the park in Appendix A, is the “Northern Fields and Waterways” section of the park. Concerns regarding the natural environment will be covered first. This will be followed by historical, social, and economic effects that would result from the project. Each resource will be considered in the realm of each of the alternatives, in order to provide an accurate comparison of their differences.

The park used a variety of methods in evaluating the consequences of each alternative. Experts were consulted in determining how fish habitat, archeological discoveries, and downstream irrigators would be affected. A Washington State Fish Biologist evaluated the potential for fish reintroduction into the restored water course, and how this would be affected by the low water flow in the late summer. To determine the likelihood of archaeological discoveries the Whitman Mission NHS Chief of Interpretation and Resources, a trained archaeologist, was consulted. Additionally, the cultural resource advisory in the National Park Service’s Seattle office were consulted for advice through the NPS Assessment of Effects on Cultural Resource Process. Irrigation rights were evaluated by the Walla Walla County Watermaster, who approved the Doan Creek concept as one that would maintain the water rights of downstream irrigators. The park staff evaluated the proximity of neighbors and visitors to the excavation site, expected duration of excavation, the amount of noise created by the machinery used during

excavation, and the general wind direction at the park to determine how park visitors and neighbors would be affected by the project.

Fish Habitat

At present fish have been spotted traveling through the park's irrigation ditch, but the fish habitat that this assessment is concerned with is that which would be created as a result of this project, the excavation of a serpentine channel to restore a more natural Doan Creek. Washington Department of Fish and Game have already documented the following fish in Doan Creek: Rainbow/Steelhead, speckled dace, redbreasted shiner, 3 species of sculpins and the common carp. It is anticipated that the restored habitat will also support coho or Chinook salmon.

Alternative A (No Action): Alternative A requires that the park install a fish screen to comply with Washington state regulations protecting fish, which would remove the irrigation ditch as a potential fish habitat. The screen will also spill some water into the Northern Fields and Waterways region of the park, which would keep that area wetter but, by itself, would not create conditions suitable for fish habitat. The water would flow down a shallow ditch to the intake of a broken, abandoned siphon located 300 feet north of the maintenance shop. The water would fall into the siphon intake, flow 500 feet in the buried pipe west to Mill Creek, then exit through a break in the pipe into Mill Creek. There would be no chance of having hatchery-reared or native fish in the irrigation ditch/Doan Creek.

Alternative B: This option would restore the creek but would only provide marginal fish habitat because of the rapid flow in the restored channel due to fewer meanderings and a steeper drop off from the midpoint of Doan Creek to its entrance in Mill Creek. The water may carry more suspended soil due to erosion of the channel's banks and downcutting the streambed in an effort to reach equilibrium between Mill Creek and the elevation of the diversion box and fish screen at the park's east boundary. There is a slight chance that hatchery-reared or native fish would enter, survive, and spawn in Doan Creek with the kind of restoration under this alternative.

Alternative C (Preferred): Alternative C would restore Doan Creek along a path which is more gradual in its descent to Mill Creek and includes meanderings. These factors would ensure a healthier and more natural fish habitat than those discussed in Alternative B. The mouth of the restored Doan Creek would have no barrier. Native and hatchery fish coming up the Walla Walla River then, up Mill Creek, would have free access into the restored Doan Creek. Alternative C's longer water course provides a more gradual slope along the restored stream which will ensure less potential streambed and streambank erosion. The Washington State Department of Fish and Wildlife habitat biologist designed this restoration alternative as the optimal choice for fish habitat within the park and concluded that there is a high chance that hatchery-reared or native fish would enter, survive, and spawn in Doan Creek with the kind of restoration.

Alternative D: This alternative would restore Doan Creek using the same plan as Alternative C. As a result this alternative would also provide optimal fish habitat. There is a high chance that hatchery-reared or native fish would enter, survive, and spawn in Doan Creek with the kind of restoration under this alternative. This alternative has the added indirect benefit of water conservation, because it eliminates water seepage, and reduces evaporation, out of an open irrigation ditch.

Archeological Discoveries

Whitman Mission NHS is an area of historical significance, and items of archeological significance could potentially be discovered during the process. The northern one-third of Whitman Mission NHS has never had archeological testing to the extent that Thomas Garth and Paul Schumacher, both NPS archeologists, tested on either side of the Oregon Trail. No test trenches were dug near the maintenance shop or west, north, or east of the shop. The entire area was part of a farm until the late 1950s with fields along the planned route of the restored Doan Creek.

However, the fields north, east, and west of the park shop building were repeatedly plowed for agricultural use until the land was purchased by the federal government in the late 1950s. The only archeological testing near this area of the park occurred approximately 100 feet northeast of the Great Grave. This occurred before installation of a water pumping station. The test excavation showed a plow zone not more than 12 inches deep. The restored Doan Creek channel would be approximately 12 inches deep

Alternative A (No Action): Alternative A does not involve any excavation. The potential discovery of artifacts is therefore not a factor.

Alternative B: Excavation of the restored channel under Alternative B could result in the discovery of artifacts of cultural or historical significance. A trained archeologist, on staff at Whitman Mission, will be on-site during excavation to restore the Doan Creek streambed. Any inadvertent archeological discovery would halt excavation until the significance of the discovery was determined through consultation with the Confederated Tribes of the Umatilla Indian Reservation and with National Park Service cultural resource advisors for the park.

This alternative provides a shorter, steeper channel to Mill Creek. The shorter reach would provide less likelihood of inadvertent archeological discoveries during new channel excavation. However, with the increased potential for erosion with this alternative, potential damage to unknown, buried archeological sites is greater. Erosion could uncover and then destroy a site before park staff notices any damage to the park resource.

Alternative C (Preferred): Excavation of the longer serpentine water course under Alternative C could result in the discovery of artifacts of cultural or historical significance. This alternative provides a longer, less steep channel to Mill Creek. The longer reach would provide a slightly greater likelihood of inadvertent archeological discoveries during new channel excavation. Most of the additional length with this alternative is through the old channel of Mill Creek composed of water-worn cobbles. As with alternative B, a trained archeologist, on staff at Whitman Mission, will be on-site during excavation of a new Doan Creek channel. Any inadvertent archeological

discovery would halt excavation until the significance of the discovery was determined through consultation with the Confederated Tribes of the Umatilla Indian Reservation and with National Park Service cultural resource advisors for the park.

With the more gradual slope of this alternative, less erosion would occur after initial excavation for the restored stream. The entire reach of the restored Doan Creek would be more stable, resulting in less likelihood that erosion could uncover and then destroy a site before park staff notices any damage to the park resource.

Alternative D: Excavation of the restored channel under Alternative D could result in the discovery of artifacts of cultural or historical significance.

As with alternatives B and C, a trained archeologist on staff at Whitman Mission will be on-site during excavation of a new Doan Creek channel. Any inadvertent archeological discovery would halt excavation until the significance of the discovery was determined through consultation with the Confederated Tribes of the Umatilla Indian Reservation and with National Park Service cultural resource advisors for the park.

The more gradual slope of this alternative, like alternative C, would result in less erosion after initial excavation of the new channel. The entire reach of the restored Doan Creek would be more stable, resulting in less likelihood that erosion could uncover and then destroy a site before park staff notices any damage to the park resource. Burying a pipe along part of the current irrigation ditch/stream channel would not create a greater risk of archeological resource damage than there is under the No Action alternative, because the pipe would not be put into a new trench, it would be laid on the current bottom of the irrigation ditch. Little or no additional soil disturbance would be required. Burying the pipe with soil scraped from either side of the irrigation ditch would have to be carefully done so that no soil disturbance occurred below the old plowzone.

Irrigation and Water Rights

Irrigators downstream from the point of diversion from the irrigation ditch into the restored channel would be affected by this project. Installation of a fish screen does not increase or decrease any irrigator's rights to water from Doan Creek. The state has already granted irrigators their water rights. Under all of these alternatives Washington state laws governing water rights would be honored.

It should also be noted that there is no net loss of available irrigation water due to the NPS action. Various state laws have mandated that all irrigation pump intakes be screened to prevent fish entry. Water used to power the cleaning paddles would be unavailable for irrigation use whether done at the Park's eastern boundary or at the other downstream irrigators intakes. It is the requirement to prevent fish entry into the pump intakes that may reduce the availability of irrigation water.

Alternative A (No Action): The fish screen intended for installation at the Whitman Mission NHS spills some water out of the irrigation ditch in order to keep itself clean. The waterpower from the Doan Creek current moves a paddle wheel that has brushes attached to it. The brushes remove water-borne debris that accumulates against the metal screen, keeping it clean so irrigation water can pass through the small holes, but fish cannot. During most of the year, the Doan Creek volume is sufficient to operate the fish screen and satisfy irrigators' water rights. In late summer when water volume diminishes, the three irrigators downstream from the fish screen may not receive their full water right, even though some water is remaining outside of the irrigation ditch as a consequence of the fish screen operation. The water that moves the cleaning brushes would no longer be available to downstream irrigators.

Alternative B: Because this alternative will divert water into the restored Doan Creek streambed, downstream irrigators could see a reduction in the amount of water that comes down the irrigation ditch. However, according to Dave Karl, an area habitat biologist with the Washington State Department of Fish and Wildlife, the restored creek bed could, when water levels are low, be allowed to run dry without doing any harm to the fish habitat. So, unless the total flow of Doan Creek, at the park's eastern boundary drops

below the total amount of state granted irrigation water rights, the restored stream would not interrupt the legal water rights the down stream users have. Some park neighbors may perceive operation of the fish screen paddles as “wasting” water that could be used for irrigation. During late summer when water volume in Doan Creek is low, the fish screen would be adjusted so that only the minimum amount of water needed to drive the cleaning brushes would go into the restored Doan Creek, instead of the irrigation ditch. Washington state laws governing water rights would be honored.

Alternative C (Preferred): Because this alternative will divert water into the restored Doan Creek water course, like alternative B, downstream irrigators *could* see a reduction in the amount of water that comes down the irrigation ditch. However, according to Dave Karl, an area habitat biologist with the Washington State Department of Fish and Wildlife, the restored creek bed could, when water levels are low, be allowed to run dry without doing any harm to the fish habitat. So, unless the total flow in the Doan Creek, at the park’s eastern boundary drops below the total amount of state granted irrigation water rights, the restored channel would not cause the irrigators downstream from the diversion point to go without the water they are legally entitled to. As in alternative B, the fish screen would be adjusted during times of low water volume so that the downstream irrigators would receive as much water as possible to satisfying their water rights from Doan Creek. Washington state laws governing water rights would be honored. Other power sources for the cleaning paddles could also be used, thus allowing more water to be used for irrigation.

Alternative D: Because this alternative, like alternatives B and C, will divert water into the restored Doan Creek channel, downstream irrigators *could* see a reduction in the amount of water that comes down the irrigation ditch. However, according to Dave Karl, an area habitat biologist with the Washington State Department of Fish and Wildlife, the restored creek bed could, when water levels are low, be allowed to run dry without doing any harm to the fish habitat. So, unless the total flow of Doan Creek, at the park’s eastern boundary drops below the total amount of state granted irrigation water rights, the restored stream would not interrupt the legal water rights the down stream users have. As in alternative B, the fish screen would be adjusted during times of low water volume so that the downstream irrigators would receive as much water as possible to satisfying their

water rights from Doan Creek. Washington state laws governing water rights would be honored. Other power sources for the cleaning paddles could also be used, thus allowing more water to be used for irrigation.

Under this alternative, part of the irrigation ditch would be enclosed in a buried pipe. Over the long-term, this may actually prevent some water from seeping into the ground and result in slightly more water available to the downstream irrigators. However, over the short-term, during the project work, all of the irrigation water would have to be diverted into the restored Doan Creek so equipment could lay pipe and bury it in the irrigation ditch upstream from the Oregon Trail. Downstream irrigators would be without irrigation water approximately seven to ten workdays.

Park Visitors

The restoration of a Doan Creek water course would affect visitors in different ways for each of the alternatives.

Alternative A (No Action): This alternative would have no *new* effect on visitors of the park. The irrigation ditch/Doan Creek may have its water diverted for approximately one week each summer so park maintenance staff can work in the ditch cleaning vegetation and sediment out of it. This annual practice has occurred for over a decade.

Alternative B: This alternative would affect visitors of the park during the excavation of the creek bed because it would increase the dust in the air and the noise level. The restored channel in this alternative is shorter than in alternative C, so the duration of noise and dust would be 30% less. Because the restored channel under this alternative is in the northeast quarter of the park and along the north boundary, most noise and dust would be further away from visitors than with any other alternative. Prevailing winds would carry any dust away from the typical visitor use areas. Park neighbors to the north and east of Whitman Mission may be impacted by dust. The excavation is expected to last five to seven workdays.

Alternative C (Preferred): Visitors to the park will be affected by the noise and dust levels under this alternative as well. Additionally, because the restored streambed will cut back through the park across the northern fields and waterways, part of the restored channel will be closer to park visitors, especially near the picnic area. With the prevailing winds at Whitman Mission, the dust should go toward the northeast, away from the picnic area and typical visitor areas. The total length of channel excavation is approximately 30% longer than with alternative B, and is expected to last seven to ten workdays.

After this alternative is completed, those visitors who park in the Whitman Mission parking lot and use this area of Mill Creek to fish will only be able to move from one side of the restored channel to the other via the culvert installed for access to the northernmost section of the park. This culvert will be designed to be “fish-friendly” and no more than twelve feet in length.

Alternative D: This alternative will have a greater effect on visitors than Alternative C. In addition to the dust and noise near the picnic area, this alternative will cause more of a disruption to the visitors of the park. The installation of a pipe to replace part of the irrigation ditch would take place closer to the historical areas of the park more frequently used by visitors. Excavating the new Doan Creek channel and burying a pipe in the part of the irrigation ditch upstream from the Oregon Trail will produce noise and dust in part of the visitor use area for approximately seven workdays, in addition to the seven to ten workdays needed to excavate the restored Doan Creek channel. Prevailing winds would carry dust away from most of the visitor use area.

Park Neighbors

Neighbors of the Whitman Mission NHS would be affected by the restoration of Doan Creek.

Alternative A (No Action): This alternative would have no different effect on the park’s neighbors than the current impacts from annual cleaning of the irrigation ditch.

Alternative B: This alternative would affect neighbors during excavation by increasing the noise and dust levels. The restored channel in this alternative is shorter than in alternative C, so the duration of noise and dust would be 30% less. Because the restored stream under this alternative is in the northeast quarter of the park and along the north boundary, park neighbors to the north and east of Whitman Mission may be impacted by dust. The excavation is expected to last five to seven workdays. In general, dust should not be a factor since the prevailing wind pushes it away from the park and there should be enough distance to down-wind neighbors to dissipate it. If the soil is exceptionally dry and powder-like, it could be sprayed with water to mitigate the dust, if necessary.

Additionally, this alternative could affect the neighboring railroad embankment which runs along the north border (see figure). With surface water of Doan Creek running beside the railroad embankment, a long-term impact could be the softening and instability of the embankment on which the tracks run.

Alternative C (Preferred): Under this alternative the only effects on neighbors of the park will be the increase in noise and dust levels during the channel excavation. Under alternative C, some of the excavation work is farther away from the park's neighbors on the north and east sides, so they may have less impact from dust than with alternative B.

Alternative D: Neighbors will see a larger impact with this alternative than in Alternative C. Excavating the new Doan Creek water course and burying a pipe in the part of the irrigation ditch upstream from the Oregon Trail will produce noise and dust for approximately ten to fourteen workdays. The southwest prevailing winds through the park may carry dust to neighbors north and east of the park.

Chapter Four: Cumulative Impacts and Sustainability

Introduction

This chapter provides a discussion of the cumulative impacts of each of the alternatives previously discussed. When considering the cumulative impacts, the more immediate and specific environmental consequences of the last chapter will be mentioned but not explored in detail. Instead, they will be incorporated, along with the long term and more general impacts of the project, into an analysis of the cumulative impacts of each of the alternatives. The resources will be discussed in the same order as the previous chapter, and considered in the realm of each alternative.

Additionally, this chapter looks at the sustainability of each of the alternatives, as well as their permanent affects on resources and management possibilities.

Cumulative Impacts

Fish Habitat

Alternative A (No Action): This alternative will do nothing to improve or degrade the fish habitat of the Doan Creek channel. It will however, permanently remove the Doan Creek irrigation ditch as a potential habitat for fish.

Alternative B: Due to the straight, steep nature of the channel proposed in Alternative B, even if fish were able to enter the restored creek, there would be very little chance that they would survive and spawn because they would be discouraged by high levels of silt created by the erosion of the stream bank and the rapid movement of the water. Therefore the potential for Alternative B to provide long term habitat and spawning ground for hatchery-reared or native fish is minimal.

Alternative C: Due to the meanderings and gradual descent of the channel created by Alternative C, fish would be more likely to enter the restored Doan Creek than they would be in Alternative B. Additionally, the slow moving water and the pools created in this alternative would provide good spawning habitat for native or hatchery-reared fish. This option would have the long term effect of providing good fish habitat that fish could pass through and where spawning grounds could be established.

Alternative D: This alternative would have the same cumulative effects on fish habitat as Alternative C.

Archaeological Discoveries

Alternative A (No Action): There will be no short term or cumulative archaeological effects under Alternative A.

Alternative B: The potential for inadvertent discovery of artifacts of cultural and historical significance would only exist during channel excavation. There is no long term potential for archaeological discovery under this alternative.

Alternative C: This alternative would have the same effect on archaeological discoveries as Alternative B.

Alternative D: This alternative would have the same effect on archaeological discoveries at Alternative B.

Irrigation and Water Rights

Alternative A (No Action): For this alternative the long term effects on the three downstream irrigators would be the continual loss of the amount of water required to move the cleaning brushes for the fish screen. This would exist for as long as the fish screen remains in place, but would only put stress on water availability during late summers when conditions are particularly hot and dry.

Alternative B: The continual diversion of water into the restored Doan Creek channel would reduce the flow of water through the Doan Creek irrigation ditch. However, at any time after the completion of the project, the restored channel could be allowed to run dry without doing harm to the fish habitat. Washington state requires the fish screen, and a minimum amount of water is required to operate the cleaning paddles on the screen. Downstream irrigators may be affected only during late summers when conditions are particularly hot and dry. During those times of the reduced water supply, the amount of water channeled into the restored creek can be altered to the minimum required to operate the cleaning paddles on the screen to minimize the impact on irrigators. Washington state law governing water rights would be honored. Alternate power sources could be utilized to power the cleaning paddles to make the maximum amount of water available for irrigation.

Alternative C: This alternative would have the same effect on downstream irrigators as Alternative B.

Alternative D: This alternative will have all of the same effects as Alternative B. However, the insertion of the irrigation pipe would cause a short term inconvenience for downstream irrigators as all water would have to be diverted during pipe installation. In the long run though, the pipe would have a positive overall effect as it would allow more water to get downstream by preventing its absorption into the ground.

Park Visitors

Alternative A (No Action): The insertion of a fish screen would have no new effect on park visitors.

Alternative B: This alternative will temporarily inconvenience visitors during excavation by increasing noise and dust levels. However, the only long term change that will occur in the area park visitors frequent is that the water level in the Doan Irrigation channel will be slightly reduced due to the diversion of water into the restored channel.

Alternative C: This alternative would have the same effects on visitors as alternative B. Additionally, because this reestablished streambed would cut across the middle of the Northern Fields and Waterways, access to that area for fishermen will be permanently changed so that they must walk across a culvert to get to the northernmost part of the property.

Alternative D: Alternative D would have the same effects as Alternative C. However, the overall short term disturbance caused to visitors would be greatest in this alternative because pipe installation would take place close to the historical sites visitors come to see. However, in the long run, the time required for the maintenance crew to clear vegetation out of the ditch would be reduced because the length of the ditch would have been reduced. As a result, the period in which the water must be completely diverted to allow for ditch cleaning would be shorter, thus affecting visitors less than current maintenance practices.

Park Neighbors

Alternative A (No Action): This alternative would not have any new effects on the park's neighbors.

Alternative B: This alternative would have the same short term effect on neighbors as it does on visitors, namely, it would temporarily increase dust and noise levels, especially for those residing North and East of the park. The major long term effect that should be considered is the potential for the softening of the neighboring railroad embankment.

Alternative C: This alternative would also temporarily increase dust and noise levels for neighbors. However, due to the intended location of the channel under Alternative C, the excavation would be farther from the park's borders and therefore its neighbors, thus reducing the disturbance. Additionally, the new channel will not run along the railroad embankment, which eliminates that as a potential long term concern.

Alternative D: This would have a longer short term impact on neighbors because the project would take longer to complete. However, like Alternative C, there are no long term impact concerns associated with Alternative D.

Sustainability and Long Term Management

Long Term Management Possibilities Lost if Project is Completed

Alternative A (No Action): None

Alternative B: Although this would be a faster and easier project to complete, it would be less conducive to reintroduction of fish into Doan Creek, and could create ongoing erosion problems.

Alternative C: No long term management possibilities would be lost, however the reintroduction of fish into the restored channel would create additional management responsibilities for the park staff.

Alternative D: No long term management possibilities would be lost, however the reintroduction of fish into the restored channel would create additional management responsibilities for the park staff.

Lost or Reduced Productivity of Park Resources

Alternative A (No Action): none

Alternative B: Soil resources could be reduced due to increased erosion.

Alternative C: none

Alternative D: none

Irretrievable Commitment of Resources

Alternative A (No Action): The water required to operate the brushes that clean the fish screen will be lost.

Alternative B: The water required to operate the brushes that clean the fish screen and the minimal amount of water needed to maintain fish habitat in the restored creek.

Alternative C: The water required to operate the brushes that clean the fish screen and the minimal amount of water needed to maintain fish habitat in the restored creek.

Alternative D: The water required to operate the brushes that clean the fish screen and the minimal amount of water needed to maintain fish habitat in the restored creek. Additionally, the open irrigation channel would be lost where the pipe was installed.

Adverse Impacts that Cannot be Mitigated

Alternative A (No Action): none

Alternative B: Softening of the railroad embankment, higher levels of erosion

Alternative C: none

Alternative D: none

Impairment Conclusions

Alternatives B, C, and D in this document were developed to provide park management with a way to manage the water spilled through the fish screen while enhancing the fish habitat within the park. Alternative C was the preferred one because it has less potential

for erosion and more potential for successful fish reintroduction than any of the other alternatives.

The park is required to install a permanent fish screen by state mandate or face legal action. Under Alternative A, park management would take no action to direct the spilled water towards Mill Creek. The topography of the northern one-third of the park will direct the water gradually toward the north boundary of the park, then across that boundary and into a borrow ditch which runs west beside a six foot tall railroad embankment. The spilled water eventually flows into Mill Creek as with the other alternatives, but under Alternative A there is no action to create a channel to benefit fish. No park resource would be impaired under this alternative but no fish habitat would be created either.

Alternatives B and C restore a Doan Creek channel that would carry water from the fish screen at the park's east boundary to Mill Creek. Alternative B would create a shorter change that has a generally steeper gradient than Alternative C. This steeper gradient has a greater potential for erosion of the restored streambed and banks. Park staff would have to closely monitor the stream and be prepared to replace soil and stream side plants to control erosion as a mitigation measure.

Through monitoring and repair of erosion spots along the restored creek, park staff would ensure no impairment of park resources occurred. The Walla Walla County Conservation District and the Walla Walla District Office of the Army Corps of Engineers would be available for consultation if the park staff identified an erosion problem with the restored channel under Alternative B.

Alternative C presents the least likelihood of adverse impacts to the park, and no impairment is expected. It has a more gradual slope to Mill Creek, less potential for erosion, and was designed by a Washington State Department of Fish and Wildlife Fish Biologist to provide an ideal habitat for fish reintroduction. In providing this new habitat, Alternative C would fulfill the "re-establishment of Doan Creek" action item in the Whitman Mission General Management Plan (page 16).

Alternative D would create the same channel as Alternative C. Alternative D would create more short term impacts while pipe installation was occurring in the current irrigation ditch. The impacts for the new Doan Creek water course are discussed under Alternative C, and no impairment to park resources is expected. However, alternative D would require engineering studies and plans that would create a need for additional environmental and cultural resource compliance if the action under the alternative D were to take place at a future date.

Chapter Five: Consultation and Coordination

In order to complete this Environmental Assessment, the Whitman Mission National Historic Site consulted with the following individuals and agencies:

- Neighbors upstream and downstream along Doan Creek
- Washington Department of Ecology
- Washington Department of Fish and Wildlife
- Walla Walla County Conservation District
- National Park Service Water Resources Division
- United States Fish and Wildlife Service
- National Park Service Pacific West Region General Management Planning Team

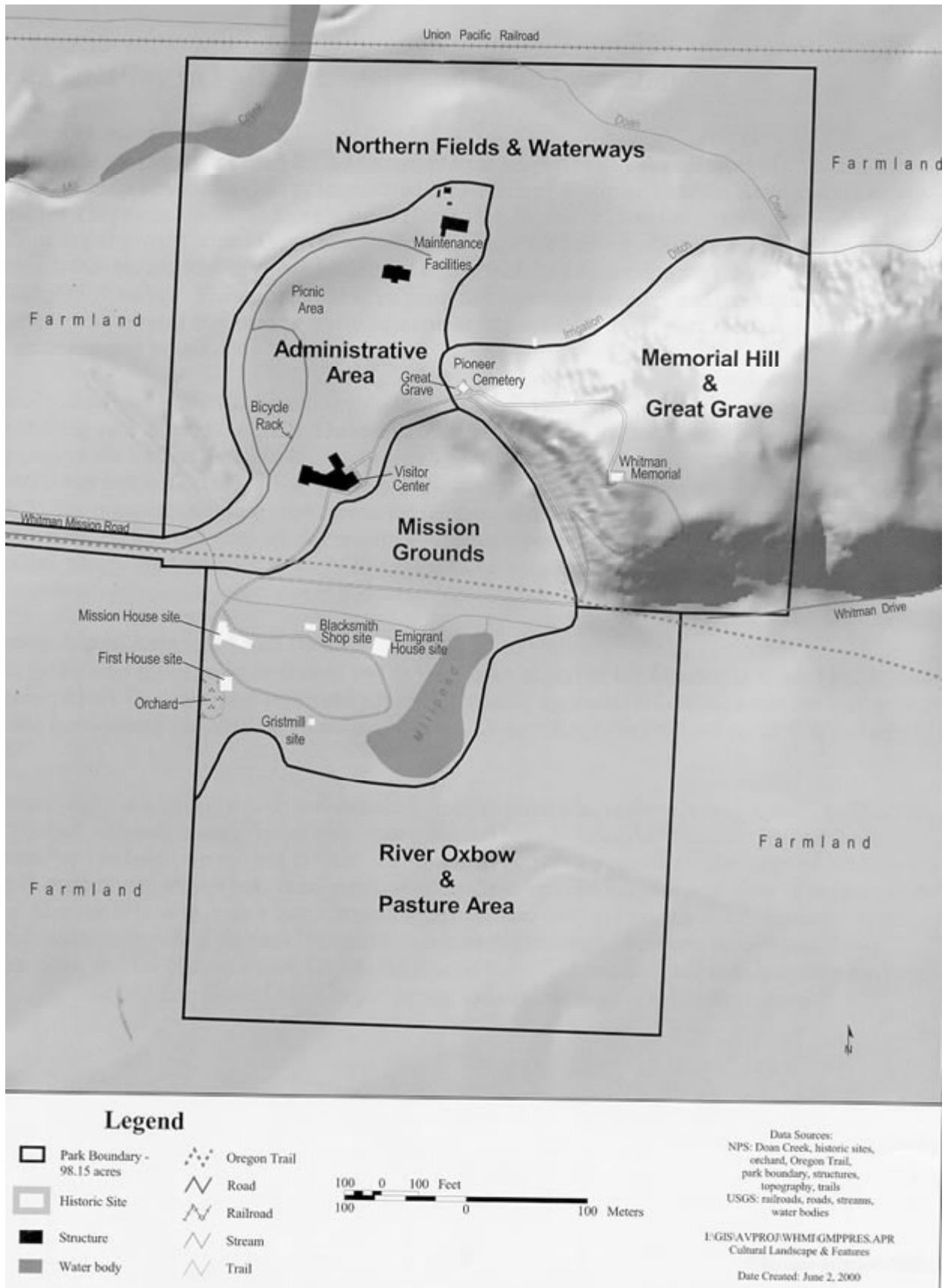
Chapter Six: References

United States Department of the Interior. National Park Service. Whitman Mission National Historic Site. *General Management Plan*. Sept. 2000.

Inter-Fluve Inc. *Doan Creek Restoration Plan*. 30 Jan. 1995.

Walla Walla County Conservation District. *Doan Creek Channel Restoration*. 18 Aug. 2003.

Appendix A



Appendix B

Doan Creek Channel Restoration

For the National Park Service Whitman Mission National Historic Site August 18, 2003



WALLA WALLA COUNTY CONSERVATION DISTRICT



1501 Business One Circle, Suite 101 Walla Walla, WA
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GIS USGS topoquad, Doan Creek Basin

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SITE DESCRIPTION

Doan Creek is a small tributary stream located within the Walla Walla watershed in Walla Walla County, Washington. Averaging approximately 1 to 2 cfs it is primarily fed by springs and ground water seepage. Historically it was a source for crop irrigation water for the Whitman Mission Site. Although still serving as a source for irrigation along its reach, for over 70 years it has not been suitable for fish habitat. This is due to the modifications made to divert it from Mill Creek solely for irrigation. The Remaining from Doan Creek that enters Mill Creek is from a source which excludes fish passage.

PROJECT OBJECTIVE

The goal of this restoration project is to introduce fish passage from Mill Creek back to Doan Creek. Bypassing the existing irrigation ditch and placing the channel along its original route will aid in providing habitat for fish; primarily the area's endangered species. It will also relieve the users of the irrigation ditch of having to maintain the ditch also as a fish bearing stream. The proposed channel is approximately 2500 ft in length, with meanders.

PROJECT COMPONENTS

Stream Location

In July of this year the WWCCD did a topographic survey of the area. The topography data from this survey helped to determine the best channel route for Doan Creek. This route is outlined on the map "topographic survey" in the report appendix. The yellow dotted line indicates the most appropriate direct route from the existing concrete diversion structure to Mill Creek. Stations along the direct route are listed on the map to 2150 ft. "0+00" is the beginning at the concrete diversion, while "21+50" is the entry to Mill Creek. These stations will be referred to in the final design for specific details in stream structure. The light blue line outlines the stream meanders in place. These meanders are necessary for fish habitat.

Stream Structure and Construction

The average slope of the stream channel will be -0.9%. Portions of the stream that exceed a slope of -1% will have measures incorporated in the channel for stability. These stabilizing structures may include: 1 ft thick 6" minus gravel lining of the channel bottom, log structures, and pools within the channel at the end of a steep slope to dissipate energy. Woody debris will be placed at a 30 pieces per hundred feet of stream length. The debris will consist of 3" to 9" diameter pieces of various lengths laid along and in the stream. Installed for fish habitat, much of the debris will be included in multi-piece structures to maximize shade and cover. The basic cross section of the constructed channel will have a 1 ft bottom width with near vertical sides at a typical depth of 1 ft.

Excavating for the channel will be minimal. Because of the streams small cross section and the consistent declining slope in topography the channel will be constructed to closely match the natural lay of the land along the route specified.

Planting

After constructing the stream it will be necessary to plant the area with species native to the Eastern Washington region. A list of native plants is included in the appendix. Plants include trees, shrubs, and grasses. Bare-root trees and shrubs shall be planted in permeable 15 ft wide plastic mulch sections. The plastic mulch will maintain soil moisture and control weed competition around the new plants. Plants shall be placed on the mulch with a planting radius of 3 ft from each other. The grass mix will be a 3 seed variety including native grasses.

Maintenance

Once implemented, the greatest variable for the success of the project will be proper maintenance of the established vegetation. Noxious weeds are very aggressive at choking out new vegetation and will greatly affect the health of stream habitat if given the chance to take over the area. The proper maintenance to be performed on this site will include spraying, mowing of grasses, hand weeding, and replanting where necessary. Primarily canary grass will be a problem along the stream.

REFERENCES

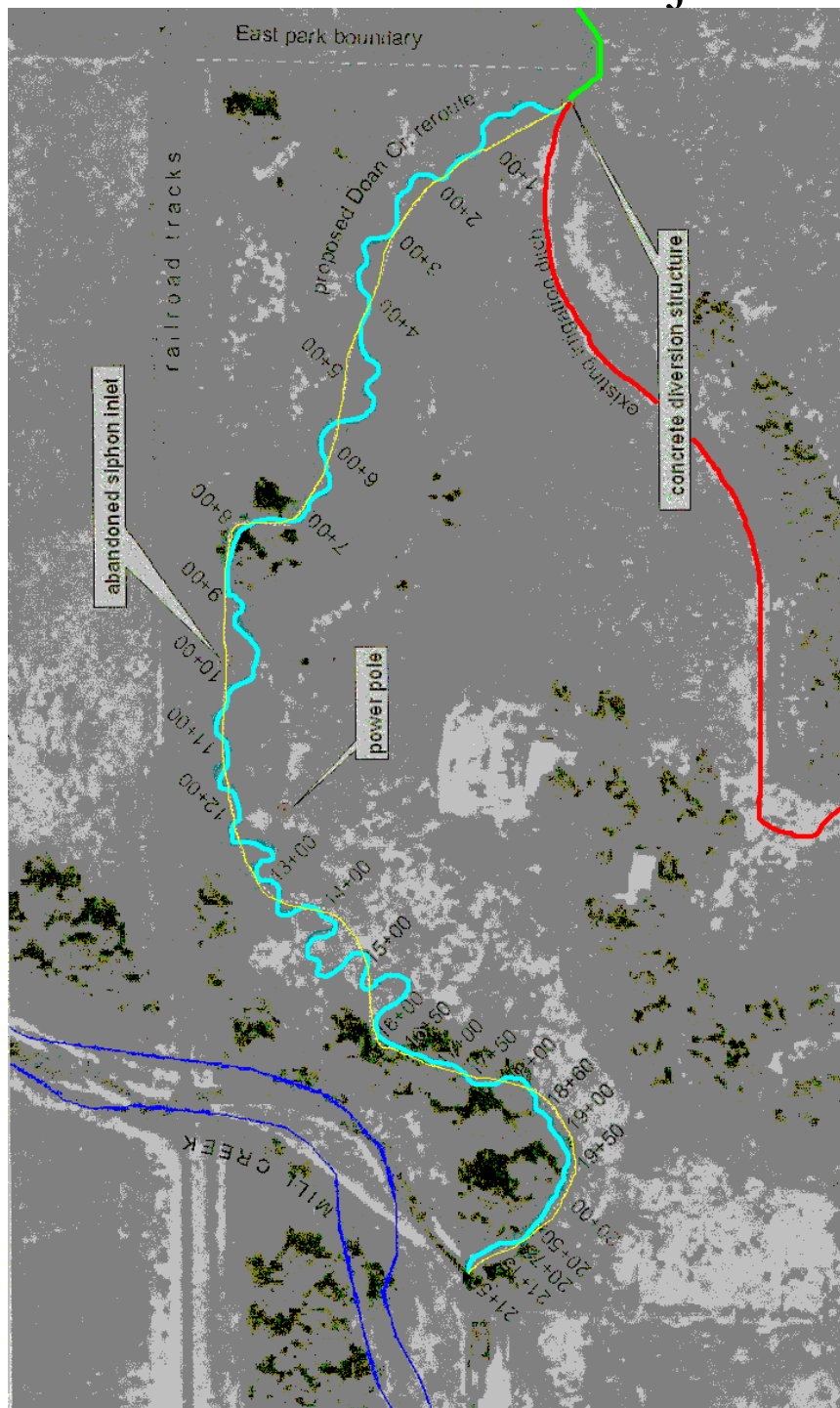
Doug Higbee District Engineer, E.I.T. Walla Walla
County Conservation District Walla Walla, WA

Bruce Heiner Senior Engineer, P.E. Washington
Department of Fish and Wildlife Pullman, WA.

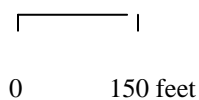
Dave Karl Area Habitat Biologist Washington Department
of Fish and Wildlife Walla Walla, WA

Rick Jones District Coordinator Walla Walla County
Conservation District Walla Walla, WA

Doan Creek Reroute Project View



- New Doan Creek Basic Route
- New Doan Creek Detailed Route
- Irrigation Ditch
- Doan Creek
- Mill Creek



Native Riparian Trees/Shrubs for Eastern Washington and Oregon, (Partial List)

1 Rocky Mountain maple	<i>Acer glabrum</i>	MLRA: E43, E44
thinleaf alder	<i>Alnus incana</i>	MLRA: B9, B10, E43, E44
1 Sitka alder	<i>Alnus sinuata</i>	MLRA: E43
15 serviceberry	<i>Amelanchier alnifolia ssp. cusickii</i>	MLRA: B8, 9, 10, E43, E44
15 Utah serviceberry	<i>Alnus alnifolia</i>	MLRA: B8, 9, 10, E43, E44
water birch	<i>Betula occidentalis</i>	MLRA: E43, E44
15 redosier dogwood	<i>Cornus sericea</i>	MLRA: B6, B8, B9, B10, E43, E44
1 Douglas' hawthorn	<i>Crataegus douglasii</i>	MLRA: B8, B9, B10, E44
15 mockorange	<i>Philadelphus lewisii</i>	MLRA: B9, B10, E43, E44
C ponderosa pine	<i>Pinus ponderosa</i>	MLRA: B9, B10, E43, E44
15 ninebark	<i>Physocarpus malvaceus</i>	MLRA: B6, B9, B10, E43, E44
T quaking aspen	<i>Populus tremuloides</i>	MLRA: B6, B8, B9, E43, E44
T black cottonwood	<i>Populus trichocarpa</i>	MLRA: B8, B9, B10, E43, E44
1T chokecherry	<i>Prunus virginiana var. melanocarpa</i>	MLRA: B6, B9, B10, E44
15 baldhip rose	<i>Rosa gymnocarpa</i>	MLRA: B8, B9
Nootka rose	<i>Rosa nutkana var. hispida</i>	MLRA: B6, B8, B9, B10, E44
5 Woods' rose	<i>Rosa woodsii var. ultramontana</i>	MLRA: B6, 9, 10, 11, E44
15 thimbleberry	<i>Rubus parviflorus</i>	MLRA: E43, E44
15 blue elderberry	<i>Sambucus cerulea</i>	MLRA: B6, B8, B9, B10, E44
15 birchleaf spirea	<i>Spiraea betulafolia</i>	MLRA: B9, B10, E43, E44
15 common snowberry	<i>Symphoricarpos albus</i>	MLRA: B9, 10, 11, E43, E44
T peachleaf willow	<i>Salix amygdaloides</i>	MLRA: B8, B9, B10
15 Drummond's willow	<i>Salix drummondiana</i>	MLRA: E43, E44
15 coyote willow	<i>Salix exigua</i>	MLRA: B7, B8, B9, B10, B11, E44
15 Pacific willow	<i>Salix lasiandra</i>	MLRA: B9, E44
15 Mackenzie's willow	<i>Salix prolixa</i>	MLRA: B8, B9, E44
15 Sitka willow	<i>Salix sitchensis</i>	MLRA: B6, B8, B9, E43, E44
C western-redcedar	<i>Thuja plicata</i>	MLRA: B9, E44, E43
C Douglas fir	<i>Pseudotsuga menziesii</i>	

Additional Oregon plant references include: "Manual of Oregon Trees and Shrubs" Randall, Keniston, Bever and Jensen, OSU Press, Corvallis, Oregon, 1981; Washington NRCS Plant Materials Technical Note #28 "Native plants recommended for wetland/riparian plantings in the Pacific Northwest", 1995; and "Washington and Oregon Conservation Grasses, Wildflowers, Legumes, Trees, and Shrubs", USDA NRCS, Spokane WA, 1995, in reference section (Sec. I) of the field office technical guide (FOTG).

B8 - B27
 B9 - Intermediate - east of W2 Airport
 E43/E44 - Mtns - up - the PP/DF area

Native Wetland Plants for Eastern Washington and Oregon
(Partial List)

Trees/Shrubs

- Pacific willow (*Salix lucida*)
- sandbar (coyote) willow (*Salix exigua*)
- Peachleaf willow (*Salix amygdaloides*)
- Lemmon's willow (*Salix lemmonii*)
- Drummond's willow (*Salix drummondiana*)
- Mackenzie's willow (*Salix prolixa*)
- Geyer's willow (*Salix geyeri*)
- black cottonwood (*Populus trichocarpa*)
- red-osier dogwood (*Cornus sericea*)
- birchleaf spirea (*Spirea betuloides*)
- bog birch (*Betula nana*)
- sitka alder (*Alnus viridis*)
- western red cedar (*Thuja plicata*)
- interior ninebark (*Physocarpus malvaceus*)
- Douglas' hawthorn (*Crataegus douglasii*)
- spring birch (*Betula occidentalis*)
- mountain alder (*Alnus incana*)
- quaking aspen (*Populus tremuloides*)
- blue elderberry (*Sambucus cerulea*)

Marshy shore herbaceous plants (eastern Washington and Oregon)

- three-square bulrush (*Scirpus pungens*)
- cattail (*Typha latifolia*)
- softstem bulrush (*Scirpus tabernaemontani*)
- hardstem bulrush (*Scirpus acutus*)
- Wapato (*Sagittaria latifolia*)
- American speedwell (*Veronica americana*)
- Marsh speedwell (*Veronica scutellata*)
- creeping spearwort (*Ranunculus flammula*)
- water starwort (*Callitriche spp.*)
- small burreed (*Sparganium minimum*)
- water parsley (*Oenanthe sarmentosa*)
- mud plantain (*Alisma gramineum*)
- American water plantain (*Alisma plantago-aquatica*)
- water smartweed (*Polygonum amphibium*)
- bog trefoil (*Lotus pinnatus*)
- tufted hairgrass (*Deschampsia cespitosa*)
- western mannagrass (*Glyceria occidentalis*)
- Columbia sedge (*Carex aperta*)

- ~~fox sedge~~ (*Carex vulpinoidea*) or (*Carex rostrata*)
- fox sedge (*Carex vulpinoidea*)
- Nebraska sedge (*Carex nebraskensis*)
- needle spikerush (*Eleocharis acicularis*)
- creeping spikerush (*Eleocharis palustris*)
- Woolgrass (*Scirpus cyperinus*)
- taper tipped rush (*Juncus acuminatus*)
- Baltic rush (*Juncus balticus*)

Aquatic and Emergent herbaceous plants (eastern Washington and Oregon)

- common duckweed (*Lemna minor*)
- yellow waterlily (*Nuphar lutea*)
- marsh pennywort (*Hydrocotyle ranunculoides*)
- pondweed (*Potamogeton natans*)
- howellia (*Howellia aquatilis*)
- waterweed (*Elodea canadensis*)
- bladderwort (*Utricularia macrorhiza*)
- water crowfoot (*Ranunculus aquatilis*)
- water moss (*Fontinalis antipyretica*)
- arrowgrass (*Triglochin maritima*)
- widgeon grass (*Ruppia maritima*)
- quillwort (*Lilaea scilloides*)

Wetland Prairie herbaceous plants (eastern Washington and Oregon)

- common camas (*Camassia quamash*)
- hyacinth brodiaea (*Triteleia hyacinthina*)
- blue-eyed grass (*Sisyrinchium idahoense*)
- northwest cinquefoil (*Potentilla gracilis*)
- large-leaf avens (*Geum macrophyllum*)
- willow-herb (*Epilobium spp.*)
- owls-clover (*Orthocarpus spp.*)
- monkeyflower (*Mimulus guttatus*)
- downingia (*Downingia elegans*)
- willow aster (*Aster hesperius*)
- mulesears (*Wyethia angustifolia*)
- gumweed (*Grindelia squarrosa*)
- water foxtail (*Alopecurus geniculatus*)
- meadow barley (*Hordeum brachyantherum*)
- California oatgrass (*Danthonia californica*)
- tufted hairgrass (*Deschampsia cespitosa*)
- elk sedge (*Carex geyeri*)
- one-sided sedge (*Carex unilateralis*)

- creeping spikerush (*Eleocharis palustris*)
- slender rush (*Juncus tenuis*)
- soft rush (*Juncus effusus*)
- yellow lady's slipper (*Cypripedium calceolus*)
- false solomon's seal (*Smilacina stellata*)

[illegible][illegible]

Alternative C